Association of Fungal And Endotoxin Measurements with Respiratory Symptoms

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CDC NIOSH

Source data for the analysis

- Health data
  - Questionnaire survey in September 2001
- Environmental exposure data
  - Environmental survey in April 2002

Questionnaire survey

- Invited all 1327 employees
- Self-administration in group session
  - NIOSH staff assistance
- Respiratory and other symptoms
  - Lower and upper
  - Systemic and rash/itchy skin
- Building relatedness of the symptoms
  - Symptoms improved when away from the building

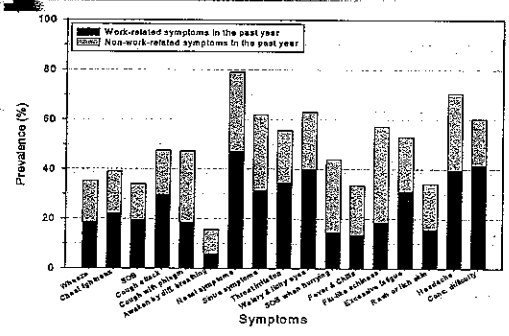
Environmental survey

- Vacuumed floor dust
- Collected from 338 employees' workstations selected by range of employee symptoms
- Analyzed for:
  - Culturable fungi
  - Endotoxin
    - Cell component of Gram-negative bacteria
  - Allergens

Purpose of data analysis

- Do occupants on floors with higher measurements of culturable fungi and endotoxin in dust within the building show increased risk of respiratory and other symptoms?

2001 Prevalence of work-related symptoms



Categorizing floors for exposure

- Two units of measurement
  - Colony forming units per mg dust (cfu/mg)
  - CFU per square meter area of floor (cfu/m²)
- Floors ranked by culturable fungi and endotoxin using both units of measurement
- Final ranking combined both units of measurements
  - Low, medium, and high exposure floors

Grouping Floors by fungi in floor dust

Exposure group	Low	Medium	High
Floor	5	6	14
	8	7	15
	10	9	16
	12	11	17
	20	19	18

Grouping Floors by floor-dust endotoxin

Exposure group	Low	Medium	High
Floor	7	6	5
	8	10	9
	11	14	15
	12	18	16
	20	19	17

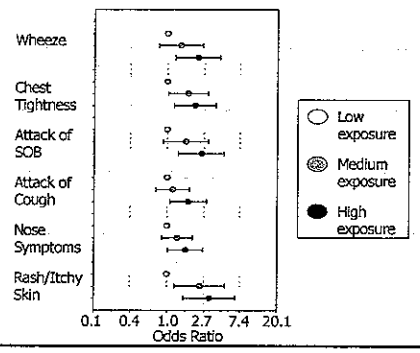
Levels of fungi and endotoxin for three exposure groups

Unit of measurement	Exposure Group		
	Low	Medium	High
	Average levels of [redacted]		
CFU/mg dust	6.7	7.9	16.5
CFU/m^2 area	900	2,200	7,600
	Average levels of [redacted]		
EU/mg dust	4.7	9.4	36.3
EU/m^2 area	800	2,900	12,400

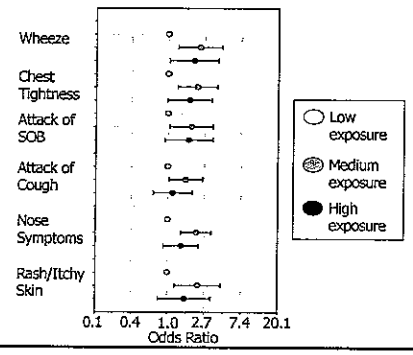
Statistical modeling

- Health outcomes: work-related symptoms in the past 12 months
- Statistical models were adjusted for:
  - Demographics: gender, age, race, smoking status, and duration of building occupancy
  - Environmental measurements: Culturable fungi and endotoxin in floor dust
- Examining association of symptoms with three exposure groups

Exposure-response relationships between fungi exposure and work-related symptoms



Exposure-response relationships between endotoxin exposure and work-related symptoms



Conclusions

- Measurements of culturable fungi and endotoxin may represent
  - Exposure to fungi or endotoxin
  - Exposure to other microbial agents or something else we did not measure
- There exist exposure-dependent respiratory and other symptom responses within the building